CLAIMS

1. A process for the elimination of sulphur compounds from a diesel fraction which comprises subjecting said sulphur compounds to an oxidation reaction using as oxidising agent at least one hydroperoxide selected from organic hydroperoxides and inorganic hydroperoxides, in the presence of a catalyst, characterized in that the catalyst is at least one organic-inorganic composite which comprises at least:

- Si,
- Ti, and
- Silicon bonded to carbon.

2. A process according to claim 1, characterized in that the catalyst is a combination of a plurality of different organic-inorganic composites, each organic-inorganic composite comprising:

- Si,
- Ti, and
- Silicon bonded to carbon.

3. A process according to claim 1, characterized in that said organic-inorganic composite has been obtained by means of a process wherein a reagent which contains Si-C groups has been added during the synthesis stage.

4. A process according to claim 1, characterized in that said organic-inorganic composite has been obtained by means of a process which comprises a post-synthesis silylation stage.

5. A process according to claim 1, characterized in that said organic-inorganic composite is a microporous molecular sieve which comprises Si-C bonds.

6. A process according to claim 5, characterized in that said microporous molecular sieve is a molecular sieve with pores formed by rings with at least 12 members selected from zeolites, ALPO and SAPO.

7. A process according to claim 6, characterized in that said microporous molecular sieve is selected from the group consisting of Ti-Beta, Ti-ITQ-7, Ti-UTD-1, Ti-Mordenite, Ti-ALPO-5 and Ti-SAPO-5.

8. A process according to claim 6, characterized in that said microporous molecular sieve is selected from the group consisting of polymorphs of zeolite Beta, and combinations thereof.

9. A process according to claim 5, characterized in that said microporous molecular sieve which comprises Si-C bonds, has the following chemical formula in its calcinated and anhydrous state:

$$y\,(A_{1/n}^{\ n+}\ XO_2):\ t\ TO_2:\ SiO_2:\ x\ TiO_2$$

where:

- X represents at least a trivalent element,
- y lies between 0 and 0.2,
- A represents mono-, di- or trivalent cations, or combinations of these,
- n = 1, 2 or 3,
- T represents at least one tetravalent element other than Si and Ti,
- t lies between 0 and 1, and
- x lies between 0.0001 and 1.

10. A process according to claim 5, characterized in that said microporous molecular sieve has been synthesised in the presence of compounds which contain Si-C groups.

11. A process according to claim 5, characterized in that said microporous molecular sieve has been subjected to a stage of post-synthesis silylation wherein Si-C bonds are created.

12. A process according to claim 7, characterized in that said microporous molecular sieve has been synthesised in a medium selected from media which comprise F- and media which comprise OH- anions.

13. A process according to claim 9, characterized in that said trivalent element X is selected from the group consisting of Fe, Al, B, Ga, Cr and combinations thereof.

14. A process according to claim 9, characterized in that said tetravalent element T is selected between V and Sn.

15. A process according to claim 9, characterized in that t lies between 0 and 0.2.

16. A process according to claim 9, characterized in that x lies between 0.001 and 1.

17. A proces according to claim 1, characterized in that said organic-inorganic composite is a mesoporous molecular sieve which comprises Si-C bonds.

18. A process according to claim 17, characterized in that the mesoporous molecular sieve employed as catalyst has been obtained from a precursor which has the chemical formula:

$$y(A^{n+}{}_{1/n}\ XO_2):\ tTO_2:\ (1\text{-}m)S,O_2:\ x\ TiO_2:\ mR(_{4-p)}\ SiO_{p/2}\ :\ sS$$

where:

- x lies between 0.005 and 0.1;
- X represents at least a trivalent element,
- y lies between 0 and 0.2,

- A represents one or more mono-, di- or trivalent compensating cations, or mixtures of these,
- n = 1, 2 or 3,
- T represents tetravalent elements other than Si and Ti,
- t lies between 0 and 1, and preferably between 0 and 0.2,
- S represents an organic compound,
- s can vary between 0 and 0.5,
- m lies between 10-6 and 0.66,
- p lies between 3 and 1,
- and wherein R is an alkyl or aromatic group, or a combination both, which comes from the silylation agent which contains the Si-C bonds.

19. A process according to claim 18, characterized in that, in order to obtain the mesoporous molecular sieve, the organic compound represented by S has been extracted chemically.

20. A process according to claim 17, characterized in that the mesoporous molecular sieve has been subjected to a post-synthesis treatment with a silylation agent in order to create new Si-C bonds.

21. A process according to claim 17, characterized in that said mesoporous molecular sieve is selected from the groups consisting of Ti-MCM-41, Ti-MCM-48, Ti-HMS, Ti-SBA-15 and Ti-TUD-1.

22.. A process for the elimination of sulphur compounds from the diesel fraction according to claim 17, characterized in that the mesoporous molecular sieve employed as catalyst has been prepared based on a precursor which has the chemical formula:

$$y\,(A_{1/n}{}^{n+}\,XO_2)\!:\ t\,TO_2\!:\ SiO_2\!:\ x\,TiO_2\!:\ sS$$

wherein:

- x lies between 0.005 and, 0.1;

- X represents at least one trivalent element,
- y lies between 0 and 0.2,
- A represents to one or more compensating mono-, di- or trivalent cations, or mixtures of these,
- $n = 1, 2$ or 3,
- T represents tetravalent elements other than Si and Ti,
- t lies between 0 and 1, and preferably between 0 and 0.2,
- S represents an organic compound and
- s can vary between 0 and 5.

23. A process according to claim 22, characterized in that said trivalent element is selected from Fe, Al, B, Ga, Cr and combinations thereof.

24. A process according to claim 22, characterized in that said tetravalent element T is selected between V and Sn.

25. A process according to claim 22, characterized in that t lies between 0 and 0.2.

26. A process according to claim 22, characterized in that S is a surfactant selected from cationic surfactants, ionic surfactants and neutral surfactants.

27. A process according to claim 22, characterized in that S is a cationic surfactant selected from:

- a compound with the formula $R_1R_2R_3R_4Q^+$ wherein Q is nitrogen or phosphorus, at least one of the substituents R_1, R_2, R_3 or R_4 is an aryl or alkyl group containing more than 6 carbon atoms and less than 36, and each of the remaining groups R_1, R_2, R_3 or R_4 is a hydrogen atom or an aryl or alkyl group with less than five carbon atoms,
- a geminal surfactant with formula $R_1R_2R_3QR_4QR_1R_2R_3$ or $R_1R_2R_3Q(R_4R_5QR_6QR_4R_5)QR_1R_2R_3$ where Q is a nitrogen or phosphorus atom and at

least one of the substitutes R_1-R_6 is an aryl or alkyl group with more than six carbon atoms and less than 36, and each of the remaining groups R_1-R_6 are hydrogen atoms or aryl or alkyl groups with less than five carbon atoms, or mixtures of these, or two of the groups, R_1, R_2, R_3 or R_4 can be interconnected giving rise to cycled compounds.

28. A process according to claim 22, characterized in that S is a cationic surfactant selected from the group consisting of cetyltrimethylammonium, dodecyltrimethylammonium, cetylpyridinium and cetyltrimethylphosphonium.

29. A process according to claim 22, characterized in that S is a cationic surfactant which has been introduced into a synthesis gel from which the precursor is prepared, in form of hydroxide, halide, nitrate, sulphate, carbonate or silicate and combinations thereof.

30. A process according to claim 22, characterized in that S is a neutral surfactant selected from the group consisting of:

- a compound with the formula $R_1R_2R_3Q$ where Q is nitrogen or phosphorus, at least one of the substituents R_1, R_2 or R_3 is an aryl or alkyl group containing more than 6 carbon atoms and less than 36, and each of the remaining groups R_1, R_2, or R_3 is a hydrogen atom or an aryl or alkyl group with less than five carbon atoms,
- a compound having the formula nR-EO which consists of alkylpolyethylene oxides, alkyl-aryl-polyethylene oxides and copolymers of alkylpolypropylene and alkylethylene, TERGITOL 15-S-9, TRITON X-114, IGEPAL RC-760, PLURONIC 64 L, TETRONIC and SORBITAN,
- esters derived from fatty acids obtained through reaction with short-chain alcohols, sugars, amino acids and amines, and
- polymers or copolymers derived from polypropylene, polyethylene, polyacrylamide or polyvinyl alcohol.

31. A process according to claim 22, characterized in that S is a neutral surfactant selected from the group consisting of lisolecithin, lecithin, dodecyl ether of pentaoxyethylene, phosphatidyldilauryldiethanolamine, digalactose diglyceride and monogalactose diglyceride.

32. A process according to claim 22, characterized in that S is a neutral surfactant selected from the group consistin of dodecylamine, cetylamine and cetylpiridine.

33. A procedure according to claim 32, characterized in that S is an anionic surfactant of formula RQ^- wherein R is an aryl or alkyl group containing more than 6 carbon atoms and less than 36, and Q is a group selected from sulphate groups, carboxylic groups and phosphate groups.

34. A process according to claim 22, characterized in that S is an anionic surfactant selected from the group consisting of dodecyl sulphate, stearic acid, Aerosol OT and phospholipids.

35. A process according to claim 22, characterized in that S is an anionic surfactant selected between phosphatyl choline and phosphatyl diethanolamine.

36. A process according to claim 22, characterized in that, to obtain the mesoporous molecular sieve, the organic compound represented by S was extracted from the precursor by calcination in a gas selected from air, N_2 and inert gases at temperatures between 300° and 700° C, and Si-C bonds were obtained by means of a silylation treatment carried out thereafter.

37. A process according to claim 22, characterized in that, to obtain the mesoporous molecular sieve, said organic compound represented by S was extracted from the precursor chemically, and Si-C bonds were obtained by means of a silylation treatment carried out thereafter.

38. A process according to claim 37, characterized in that said organic compound was extracted by treatment with a solution of an acid selected between mineral acids and organic acids, in a solvent selected from the group consisting of water, alcohols, hydrocarbons, and mixtures thereof.

39. A process according to claim 22, characterized in that said mesoporous molecular sieve comprises Ge, V, Sn, or combinations thereof, in addition to Si and Ti.

40. A process according to claim 38, characterized in that said mesoporous molecular sieve comprises, in addition, Al, B, Ga, Fe, Cr, or combinations thereof.

41. A process according to claim 1, characterized in that said organic-inorganic compound is selected from the group of amorphous inorganic siliceous solids, chemically combined with Ti in proportions of between 0.2 and 8% by weight of Ti, in oxide form, with respect to the total catalyst, and which contain silicon bonded to carbon.

42. A process according to claim 41, characterized in that said amorphous inorganic siliceous solids comprise at least 90% silica.

43. A process according to claim 41, characterized in that said amorphous inorganic siliceous solids are pyrogenic silicas selected between CAB-O-SIL and AEROSIL with specific surfaces between 40 and 450 m^2.g-1 and particle size between approximately 0.007 and 0.05 microns.

44. A process according to claim 42, characterized in that said amorphous inorganic siliceous solids are synthetic inorganic oxides of silica.

45. A process according to claim 44, characterized in that said synthetic inorganic oxide of silica is silica gel.

46. A process according to claim 41, characterized in that said siliceous solid contains in addition to Si and Ti, other elements selected from the group consisting of V, B, Zr, Mo and mixtures of these, in a percentage of less than 8%, by total weight, and in oxide form.

47. A process according to claim 41, characterized in that said siliceous solid comprises quantities of between 0.01 and 4%, by weight, of at least one promoter selected from the group consisting of alkaline metals, alkaline-earth metals and combinations of these, in oxide form.

48. A process according to claim 1, characterized in that said oxidation reaction is performed in a reactor selected from the group consisting of a discontinuous reactor, a continuously stirred tank reactor (CSTR), a fixed bed continuous reactor, a fluidised bed reactor and a boiling bed reactor.

49. A process according to claim 48, characterized in that said oxidation is performed in a discontinuous reactor, with a ratio of the diesel fraction to catalyst of between 5 and 500 by weight, and a ratio between the diesel fraction and oxidising agent of between 600 and 10 by weight.

50. A process according to claim 49, characterized in that said ratio of the diesel fraction to catalyst lies between 10 and 300 by weight.

51. A process according to claim 49, characterized in that said ratio of the diesel fraction to oxidising agent lies between 400 and 30 by weight.

52. A process according to claim 1, characterized in that said oxidation reaction is performed at a temperature of between 20 and 150° C.

53. A process according to claim 52, characterized in that said oxidation reaction is performed at a temperature of between 40 and 120° C.

54. A process according to claim 1, characterized in that said oxidation reaction is produced in a reaction time of between 2 minutes and 24 hours.

55. A process according to claim 1, characterized in that said oxidation reaction comprises a separation of the products by means of a stage selected from the group consisting of distillation, extractions and combinations thereof, with a solvent, and an, at least, partial recycling of products which have not reacted, to the reactor.